



Heat Exchanger and Collector/Dryer Unit for a Heat Exchanger

The present invention relates to a collector/dryer unit for heat exchangers, and in particular for a refrigerant condenser of a motor vehicle air-conditioning system, as well as to a heat exchanger.

Collector/dryer units are used for example for refrigerant condensers of a motor vehicle 5 air-conditioning system. In this area in particular, they are also called condenser modules, and have a collector that accommodates a dryer. Such a dryer can for example have a dryer cartridge as well as a filter, which can also be combined to form a unit.

As a rule, condensers for an air-conditioning system have a tube/fin block whose tubes are connected at both ends to a respective collector tube. A collector is situated parallel to 10 and adjacent to one of these collector tubes. This collector is connected fluidically to the adjacent collector tube via at least two overflow openings; via one of these overflow openings fluid (in particular refrigerant) can flow from the collector tube into the collector, and via the other overflow opening fluid, or refrigerant, can flow from the collector into the collector tube.

15 In motor vehicles, such condensers are standardly constructed in such a way that the collector tubes as well as the collector are oriented essentially vertically. The overflow opening through which fluid or refrigerant flows from the collector into the one collector tube, or a corresponding outlet opening of the collector, is standardly positioned in the lower region of the collector. The reason for this is in particular that in this way the 20 probability is reduced or eliminated that possible gaseous portions of the fluid or refrigerant in the container can be carried out through the outlet opening of the collector.

From DE 197 05 720 A1, a condenser is known for an air-conditioning system of a motor vehicle in which a tube-shaped extruded profile is provided to form the collector and to form a half-shell of a collector tube. An additional, separate half-shell that is integrally formed with the half-shell of the extruded profile supplements the jacket wall of the 5 collector tube. In this additional half-shell of the collector tube, manufactured separately from the extruded profile, tube ends of the tube/fin block are accommodated. This half-shell, facing the tube/fin block, is also called the base, while the half-shell facing away from this block is called the cover. In such extruded collectors having an integrated cover, as a rule the collector has a constant wall thickness over its entire length. Due to 10 the direct, extruded connection between the cover of the collector tube and the collector, as a rule there is a direct conduction of heat between the collector tube and the collector.

From EP 131 07 48 A2, a refrigerant condenser for a motor vehicle air-conditioning system is known in which the jacket wall of the collector or collector reservoir is formed by a tube and an extruded tube piece integrally formed onto the bottom of this tube. This 15 tube has in its jacket wall two bores in which corresponding collars of the adjacent collector tube engage with a force fit, so that a fluid connection is created that enables refrigerant to flow into and out of the collector. At the upper end, the collector is sealed by a pressed-on cover on which there is situated a cap-type extension piece that surrounds the upper end of the adjacent collector tube and seals it upwardly. By means of this cover, 20 as well as the force fit situated in the lower area, the collector and the collector pipe are held before soldering; soldering in these areas creates a soldered connection so that the collector and the adjacent collector tube are tightly closed at the upper end. At the lower end, the collector is closed by a sealing plug.

From EP 0 936 423 A2, a condenser is known in which the jacket wall of the collector is 25 formed by a continuous one-piece hollow cylindrical tube. The tube has an essentially constant wall thickness, and is closed at its upper end by a threaded cover.

The object of the present invention is to provide a collector/dryer unit for heat exchangers that can be manufactured economically and is operationally reliable.

According to the present invention, a collector/dryer unit is proposed according to Claim 1, and a heat exchanger is proposed according to Claim 30. Preferred constructions are in
5 particular the subject matter of the subclaims.

According to the present invention, in particular a collector/dryer unit for heat exchangers is provided that has a collector and a dryer. The dryer is accommodated in the collector in exchangeable fashion; i.e., it is not fixed therein so as to make removal impossible without destroying it. The collector has a jacket wall that extends around its longitudinal
10 axis. Seen in the longitudinal direction of the collector, in at least a segment this jacket wall is formed essentially by a first tube. In addition, the collector has at least one inlet opening for a fluid, such as refrigerant, as well as an outlet opening for the fluid. At least the inlet opening is situated in an end area facing the first axial end of the collector. The inlet opening can likewise be situated in this end area facing the first axial end of the
15 collector, or can be situated in another area of the collector, such as in particular a second end area opposite the first end. The inlet opening and the outlet opening are preferably each situated in the jacket wall of the collector. At its second axial end, facing away from the first axial end, the collector has a removal or exchange opening for exchanging the dryer. Through this removal opening, the dryer can be removed and a new dryer can be
20 installed. In addition, the collector has a detachable closure for this removal opening. The detachable closure is provided in the area of the second end. In particular by means of this detachable closure, the removal opening can be closed and opened. The closure can be detachable in such a way that in its open position it is no longer held on the collector, or in such a way that in its open position it is still held on the collector while exposing the
25 opening. On the side of the first tube facing away from the first end, an adapter device or

first profile piece is provided by means of which the detachable closure is held or supported in its closed position.

This holding or supporting can for example be such that the detachable closure engages immediately in the adapter device or first profile piece, for example via a matching 5 threading, or in such a way that it is supported or held via intermediately connected holding elements, such as for example a securing ring, on the adapter device or first profile piece, in particular in a positively locking manner.

It can be provided that a holding element that blocks the closure in its closed position must be detached before the closure can be opened; here such a holding element can be 10 for example a securing ring.

The closure is preferably held in the axial direction.

The dryer can for example have a dryer cartridge and a filter, or can be formed by these. A filter can be combined or integrated with such a dryer cartridge in a unit, or can be provided separately from such a dryer cartridge. In particular, a dryer can be a dryer/filter 15 cartridge. With respect to exemplary and preferred constructions according to the present invention of such dryer cartridges or dryer/filter cartridges, reference is made here to applicant's patent specification DE 103 06 192 A1, which in this regard is hereby incorporated into the disclosure of the present application by reference. The dryer part of this dryer is used to remove moisture, in particular water, from the fluid or refrigerant. 20 The filter is used to filter out for example particles found in the fluid or refrigerant as a result of wear or the like.

The exchangeable dryer, in particular dryer cartridge and filter or filter/dryer cartridge, is preferably inserted into the collector during manufacture, after soldering in a soldering oven.

A solderable dryer, in particular having a solderable dryer part and a solderable filter part, can also be provided. A solderable dryer is in particular such that it is not destroyed or damaged in a soldering oven.

The closure can be for example a stopper or screw closure.

- 5 In particular if this collector is for example integrated into a refrigerant condenser of a motor vehicle air-conditioning system and is installed in a motor vehicle, the second end of the collector is the upper end, so that the detachable closure is attached or housed on the upper end of the collector.

The first profile piece is preferably fitted onto the first tube of the collector and soldered thereto. The first tube can be manufactured in one piece or can be assembled from a plurality of separately manufactured parts to form a one-piece tube. For example, it can be provided that it is assembled or welded or soldered from a plurality of half-tube profiles, in particular two. Thus, for example a separating wall can be provided in the longitudinal direction of the tube. Preferably, the first tube has a cylindrical construction; however, it can also have a different cross-sectional shape. Preferably, the adapter device or first profile piece is tube-shaped or annular in shape. The adapter device can for example be an adapter. The first profile piece can also be an adapter device. In a preferred construction, the first profile piece is connected to the first tube in such a way that the first profile piece forms a jacket wall segment of the collector that is connected to the jacket wall segment formed by the first tube. The adapter device, or first profile piece, is in particular a part or device that is manufactured separately from the first tube. Particularly preferably, it is connected fixedly to the first tube, as already mentioned. Such a fixed connection can for example be produced via a welded or soldered connection. Here it is particularly preferably provided that the connection is leak proof.

20 The wall thickness of the preferably tube-shaped first profile piece is, in an advantageous

construction, greater at least in segments than the wall thickness of the first tube. In a preferred construction, the first tube has a constant wall thickness, seen in particular in the circumferential direction as well as in the longitudinal direction. In a preferred development, the inner surface of the first profile piece, seen in cross-section, is
5 essentially circular, in segments or completely. Seen at various points along its longitudinal axis, the first profile piece can have different (inner) circumferential dimensions, i.e. circumferential dimensions of its inner surface. For example, it can be provided that projections or bevelings are provided, seen in the longitudinal direction. Thus, different diameters can be provided, in particular given an inner surface that is
10 round or that is circular when regarded in cross-section.

The first tube is preferably a welded tube made of semi-finished material.

In a preferred construction, in its sealed position the closure is countersunk completely in the first profile piece. In a preferred construction of the present invention, the first profile piece has at least one groove, in particular a peripheral groove, that accepts a securing ring. This groove can be situated in an inner surface of the first profile piece. It can be provided that a securing ring is detachably accommodated in such a groove, by means of which ring the closure element can be held detachably in a closed position. In particular, here the closure can be a stopper. A detachable closing connection of the collector can thus be realized for example by a stopper having a securing ring. It can also be provided
15 that a detachable closing connection is realized by a threaded stopper or a screw closure. For this purpose, this threaded stopper or screw closure can have a threading that is screwed into a counterthreading on the first profile piece in order to effect the closure. It can be provided that the screw closure has an inner threading and the first profile piece has an outer threading, or that the screw closure has an outer threading and the first
20 profile piece has a corresponding inner threading. Preferably, at least one sealing device is provided. A sealing device is particularly preferably provided for sealing the detachably held closure against the first profile piece or adapter device. For example, for
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this purpose one or more circumferential grooves can be provided in the closure element, in each of which an O-ring is accommodated. In such a construction, it is preferably provided that the first profile piece has a sealing surface for this O-ring or O-rings. It can also be provided that such a sealing surface, or contact surface, for the O-ring or O-rings

5 is formed by a surface area of the first tube. In such a construction, it is advantageous for care to be taken that the corresponding sealing surface is provided with a corresponding tolerance range. The sealing surface can in particular be a segment of the inner surface of the first profile piece or of the first tube; here, in particular in relation to the first tube, care is to be taken that the inner diameter has correspondingly narrow tolerances, in

10 particular given a round (inner) shape. If such a sealing surface is formed by a surface segment of the first tube, the first profile piece can be made correspondingly smaller or shorter. In particular, in a preferred construction it can be provided that the first profile piece contains only a groove for receiving a securing ring, or that this creates the connection with the tube. In a preferred construction, the first profile piece is fashioned

15 with a round shape. In this way, under certain conditions the outlay of material can be kept small, and a simple processing can be enabled. The first profile piece can however also have some other shape. In particular, the first profile piece can also have an arbitrary outer contour. Such an outer contour can for example be such that a support surface to a collector tube is created. It can also be provided that, alternatively or in addition, the

20 outer contour of the first profile piece is designed in such a way that a support surface to a holder is formed. Such a holder can for example be a ring holder. Such a holder, or ring holder, can for example serve to hold a collector tube on the collector. This can for example be such that, by means of at least one such holder, a collector tube is held on the collector in clamped fashion or in a similar manner; during manufacture, a soldered connection between the collector and the holder and/or the holder and collector tube is then produced in a soldering oven. Thus, via such a holder, which can in particular be constructed as a ring holder, a positioning of the collector relative to the collector tube can advantageously be produced that, particularly preferably, is subsequently made fast, or non-detachable, by a soldering process.

In a preferred construction, the first profile piece has a short construction. In particular, it can be provided that the first profile piece, seen in the direction of the longitudinal axis of the collector, is fashioned relatively short in comparison to the first tube. It can be provided that the first profile piece is fashioned shorter in the direction of this

5 longitudinal axis than in a direction perpendicular thereto. However, it can also be provided that in the direction of the longitudinal axis the first profile piece is fashioned longer than in a direction perpendicular thereto.

Preferably, the first profile piece has a round construction.

Particularly preferably, it is provided that the wall thickness of the first profile piece is

10 greater than the wall thickness of the first tube. Variations in the wall thickness of the first profile piece can also be provided.

In a particularly preferred construction, it is provided that the first profile piece has a threading for receiving a threading provided in the closure, or is provided with a groove for receiving a securing ring by means of which the closure can be detachably held, the

15 remaining wall thickness in the area of this threading or of this groove being greater than or equal to the wall thickness of the first tube. In particular, this is to be understood such that the groove represents a recess provided in the wall, or that a helical recess is provided in the thread, and in the area of each of these recesses the remaining wall thickness is greater than or equal to the wall thickness of the first tube.

20 In a preferred construction of the present invention, the inlet opening for the fluid provided at the first collector is situated in the end area facing the first axial end. However, it can also be provided that this inlet opening is positioned at a different location, such as in particular the end area facing away from the first axial end.

In a particularly preferred construction, both the inlet opening and the outlet opening are situated in the jacket wall of the collector. It is preferably provided that the collector has rim holes. Particularly preferably, these rim holes are made so as to protrude outwards. The rim holes advantageously limit or define the inlet opening and the outlet opening.

- 5 It can also be provided that the collector has stamped-out parts that protrude outwards, having a preferably annular outer contact surface. Such stamped-out parts advantageously limit or define the inlet opening and the outlet opening.

In a particularly preferred construction, such stamped-out parts or rim holes are provided on the first tube.

- 10 In a preferred development of the present invention, a second profile piece is provided in the end area of the collector that faces the first end of this collector. In a preferred construction, this second profile piece is an extruded profile piece.

- 15 In a preferred development, this second profile piece has the inlet opening and the outlet opening for fluid, or refrigerant, of the collector. In a particularly preferred construction, this inlet opening and this outlet opening are fashioned as bores provided in the jacket wall of the second profile piece.

The second profile piece is preferably connected to the first tube, in particular immediately. This connection can in particular be a non-detachable connection, such as a soldered connection or a welded connection or the like.

- 20 The second profile piece can be closed at its end facing away from the second end of the collector by means of a detachable closure, such as for example a screw closure or a plug or the like. This detachable closure can for example be similar to the detachable closure situated on the first profile piece. In a corresponding manner, a corresponding threading

or a groove for receiving a securing ring can be provided in the second profile piece. In addition, a suitable sealing device can be provided that tightly seals this closure against this second profile piece in order to close this second profile piece. With regard to the first profile piece, or the detachable connection that was described there, a corresponding 5 sealing surface can also be provided on the second profile piece. In addition, a corresponding groove can be provided for holding the detachable closure on the second profile piece.

However, it can also be provided that the second profile piece is closed at its end facing away from the second end of the collector by a non-detachable closure. This can for 10 example seal the collector at its first end, forming a tight-sealing groove connection.

Preferably, a filter device is housed in the collector. Such a filter device can, for example with a dryer, form a unit, such as for example a dryer cartridge. Such a unit is also referred to as a dryer in the sense of the present invention.

According to the present invention, in addition a heat exchanger is proposed that has a 15 collector/dryer unit according to the present invention. Such a heat exchanger can in particular be a refrigerant condenser for a motor vehicle air-conditioning system.

In a preferred construction, such a heat exchanger has a tube block or a tube/fin block that has a multiplicity of tubes that are essentially parallel at least in parts, and, in particular in the construction as a tube/fin block, has fins situated between the tubes. The 20 first ends of each of the tubes of this block are received by a first collector tube that is situated parallel to the collector. This first collector tube is in particular situated adjacent to the collector and can for example be held thereon. The first collector tube has at least two openings, of which one is allocated to the inlet opening of the collector and one is allocated to the outlet opening of the collector, so that in each case an overflow opening 25 or overflow passages are formed. It can for example be provided that additional passage

segments or the like are placed intermediately between the mutually allocated openings. Via these overflow openings or overflow passages, fluid, or refrigerant, can flow from the first collector pipe into the collector or vice versa.

Particularly preferably, it is provided that in addition a second collector tube is provided

5 that receives the respective second ends of the tubes of the tube block or tube/fin block. In particular in such a construction having two collector tubes, it can be provided that all the tubes of the tube block or tube/fin block have a straight construction.

The tubes of the tube block or tube/fin block preferably have, on their end surfaces, openings that are connected in the interior of the tube via a passage.

10 Preferably, the second ends of the tubes of the tube block or tube/fin block are received in a second collector tube that is situated parallel to the first collector tube.

The first collector tube preferably has a shell-shaped cover part, as well as a shell-shaped base part connected thereto. This cover part and this base part are for example soldered or welded to one another. The cover part and the base part are placed on one another so as to

15 form a jacket wall of the first collector tube. In the base part, openings, such as slots, are provided that receive the first tube ends of the tube block or tube/fin block.

A second collector tube can for example be made up of a cover part and a base part, the second ends of the tubes of the tube block or tube/fin block being received there in the openings or slots of the base part.

20 In a preferred construction, the first collector tube has rim holes that protrude inward or outward in order to form openings that are preferably provided in the cover part and that face the collector. One of these rim holes is allocated to the inlet opening of the collector, and one is allocated to the outlet opening of the collector.

In a preferred construction, such rim holes of the first collector tube are plugged in telescope fashion with rim holes of the collector, forming overflow openings or overflow passages. One of these overflow openings or overflow passages enables fluid or refrigerant to flow from the first collector tube into the collector, and the other overflow 5 opening or overflow passage enables the fluid to flow from the collector into the first collector tube.

Instead of such rim holes plugged into one another in telescoping fashion, the rim holes can also be formed in such a way that rim holes of the collector and rim holes of the first 10 collector tube are situated so as to abut one another bluntly with their outwardly oriented end surfaces, the abutting end surfaces preferably being identically shaped and dimensioned. These end surfaces can for example have a circular annular shape.

It can also be provided that such rim holes, abutting one another with their end surfaces, can be sheathed by a common external radially situated sleeve. In addition, it can be provided that a sleeve is positioned radially inside these abutting rim holes. Preferably, 15 the mutually allocated rim holes are soldered to one another, and/or are soldered to the sleeve, if such a sleeve is present. Such a soldering process can for example be carried out in a soldering oven.

It can also be provided that the first collector tube has outwardly oriented projections having a preferably annular outer contact surface, forming the openings that are allocated 20 to the inlet opening or to the outlet opening of the collector.

In addition, it is preferable that the first collector tube has outwardly protruding collars, each forming an opening, that engage in the inlet opening or in the outlet opening of the collector in order to form overflow openings or overflow passages. In particular, it can be provided that the inlet opening or the outlet opening is fashioned as a bore, and,

particularly preferably, is situated on the second profile piece of the collector. In this area as well, a connection is preferably provided that is tightly sealing. Particularly preferably, a soldered connection is also provided in this area.

In addition, it is preferable that the second profile piece has an outer surface area, facing

5 the first collector tube, that is matched in its shape to an outer surface area of the first collector tube. This outer surface area of the second profile piece can for example be curved. Particularly preferably, it is provided that these outer surface areas contact one another. The corresponding outer surface area of the collector tube can for example be a cylinder segment.

10 Particularly preferably, it is provided that the overflow opening or overflow passages are fashioned according to one of the variants described in German patent application 103 38 527.4, which in this regard is hereby incorporated by reference into the subject matter of the present disclosure. The connection described there between the first collector tube and the collector can also be provided in a preferred construction, so that in this regard as

15 well reference is made to German patent application 103 38 527.4, and the statements relating thereto are incorporated into the subject matter of the present disclosure. This also relates in particular to the steps for manufacturing the connection, in particular in the area of the overflow opening or overflow passages.

However, it is to be noted that the common cover provided there on the upper end of the

20 collector or of the collector tube cannot be provided in the present invention, because the segment of the cover there that covers the collector at the top is not detachable.

In a preferred construction, however, a ring holder can be provided that covers the upper end of the first collector tube, for example in the manner indicated in German patent application 103 38 547.4, which in this regard is incorporated into the subject matter of

the present disclosure, and that has an area having an annular shape or the shape of an annular segment that completely or partially surrounds the collector.

As already described, the collector can have an extruded profile in its end area facing the first axial end, the lower end area. It can be provided with bores that are oriented towards 5 the side of the collector tube in which rim holes are made in the collector tube in order to form overflow openings or overflow passages. This second profile piece, or profile, can be connected to the first tube of the collector, which in turn is fitted on its upper end and can have a soldered first profile piece.

In the area of the lower end, or of the first axial end, a detachable closure can be provided 10 in the second profile piece, as mentioned. In a preferred construction, an opening covered by this closure can be such that the dryer can not only be removed upwardly, but can in addition be removed downwardly.

In a preferred construction, the collector and the first collector tube are held on one another, and are separated from one another by a slot.

15 The second extruded profile, as well as the construction of the overflow opening or overflow passages, can for example be as described in EP 131 07 48, which in this regard is incorporated into the subject matter of the present disclosure by reference. This is a preferred construction of the present invention.

20 The collector can have an arbitrary length. It can, for example, be shorter than the first collector tube on one or both sides. It can also be longer than the first collector tube on one or both sides. It can also have the same length as the first collector tube.

The first profile piece is preferably an extruded part. It can be provided that the first profile part and/or the second profile part has a support surface to the first collector tube

or to the cover of the first collector tube. It can also be provided that the first profile part and/or the second profile part has extruded holders.

In a particularly preferred construction, the wall thickness of the first tube is constructed such that it can withstand the burst pressures, or the pressures that occur in the collector 5 during operation. It can also be provided that a certain, e.g. smaller, increase in wall thickness is provided.

Particularly preferably, it is provided that the first profile part and/or the second profile part has a wall thickness that is greater than the wall thickness of the first tube.

Due to the fact that a detachable closure is provided at the upper end of the collector, or 10 at the second end of the collector, it is possible for an exchangeable dryer to be removed through the opening covered by this closure, or inserted through this opening, or exchanged through this opening. The exchange at the upper end is often advantageous, because heat exchangers are often constructed so that the upper end is more easily accessible. Due to the fact that in the upper end area, or second end area, of the collector 15 an adapter or profile piece is provided for a detachable closure, in a preferred construction it is not only enabled that a dryer can be exchanged through an opening situated in the upper area; rather, in addition a basis is provided for a multiplicity of cost-reducing and weight-reducing constructions. Thus, in this way it is for example made possible for the jacket wall of the collector to be constructed relatively thin over large 20 areas, while being able to withstand the pressures occurring in the collector, or burst pressures; in addition, in the area of the upper, or second, end of the collector a detachable closure can be situated that in its closed position is essentially held securely. Thus, for example a threading or grooves for receiving securing rings, or similar recesses, can be made in the profile piece or adapter device situated in the first, or upper, end area, 25 without its being necessary to fashion the collector with correspondingly thick walls along its entire length. Thus, it can be made possible for the collector to be fashioned, for

example in the area of the first tube, with walls thin enough that on the one hand it can withstand the pressures that occur during operation, or burst pressures, in the collector, but such that on the other hand this strength would no longer be sufficiently ensured if the grooves or threading for a detachable closure element were to be situated there. Thus, in a
5 preferred development it is made possible for the adapter, or the first profile piece, to be fashioned with a wall thickness that is strong enough to enable such recesses, such as grooves, threadings, and the like, to be provided without achieving critical wall thicknesses.

In the following, exemplary constructions are described on the basis of the Figures;
10 however, the present invention is not intended to be limited thereby.

Figure 1 shows a partial representation of a heat exchanger 1 according to the present invention, having a exemplary collector according to the present invention;

Figure 2 shows the upper segment from Figure 1 in an enlarged, partially sectional form;

Figure 3 shows a lower detail of the construction according to Figure 1 in an enlarged,
15 partially sectional form;

Figure 4 shows a partial sectional view of the construction according to Figure 2;

Figure 5 shows a lower end of the collector as well as of a first collector tube in a partial,
exploded view;

20 Figure 6 shows another exemplary construction of the upper segment from Figure 1; and

Figure 7 shows another exemplary construction of the lower segment from Figure 1.

Figure 1 shows an exemplary heat exchanger 1 according to the present invention, having an exemplary collector 10 according to the present invention, or having an exemplary collector/dryer unit according to the present invention, in a schematic partial view.

Heat exchanger 1 has collector 10, a first collector tube 12, and a second collector tube 5 (not shown) and a tube/fin block 14. Tube/fin block 14 has a multiplicity of tubes 16 situated in parallel that are constructed for example as flat tubes, have a straight extension, and are each received with their first end in first collector tube 12. For this purpose, openings that are fashioned as slots and that face the tube/fin block are provided in first collector tube 12 and receive these tube ends. The tube ends can, if necessary, 10 protrude slightly into collector tube 12. Second ends (not shown in Figure 1) of tubes 16 of tube/fin block 14 are correspondingly received by the second collector tube (not shown), so that via tubes 16 a flow connection is created between first collector tube 12 and the second collector tube.

In a preferred construction, the present invention is used or applied in a refrigerant 15 condenser for a motor vehicle air-conditioning system.

Here, refrigerant flows through tubes 16, so that a refrigerant connection exists via tubes 16 between first collector tube 12 and the second collector tube. It can be provided that a plurality of separating intermediate walls are installed in the collector tubes, perpendicular to the longitudinal axis thereof, so that the refrigerant is conducted through 20 tubes 16 and through the two collector tubes in serpentine fashion. Here, it can also for example be provided that a plurality of tubes 16 are positioned between each two such separating walls.

The collector tubes can each be made of a base part and a cover part, the base part facing tube/fin block 14, and the cover part facing away from this tube/fin block 14. Collector 25 10 is situated adjacent to first collector tube 12, and extends essentially parallel to this

first collector tube 12. Collector 10 can be situated on the side of first collector tube 12 facing away from the tube/fin block. It can also be situated so as to be tilted in the direction of this tube/fin block.

Such a collector 10 is not provided on the second collector tube (not shown).

- 5 The second collector tube is closed at the top and at the bottom by suitable closure means. For example, non-detachable covers can be used here. Detachable covers can also be provided. Non-detachable covers can be in particular soldered or welded.

Between tubes 16 of tube/fin block 14, fins are situated through which air can flow, in particular transverse to the direction of longitudinal extension of tubes 16.

- 10 Collector 10 has a first tube 20 and a first profile piece 22. First profile piece 22 is situated in an end area of collector 10 facing away from first end 24. This is the upper end area. Profile piece 22 extends essentially up to the second, or upper, end 26 of collector 10.

- 15 In the construction according to Figure 1, first tube 20 has an essentially hollow cylindrical construction. Profile piece 22 has an essentially round construction, and essentially has a cylindrical outer jacket surface. On an inner side, this profile piece has a shape that is further explained below on the basis of subsequent Figures.

The wall thickness of first tube 20 is less than the wall thickness of profile piece 22. First tube 20 is thus constructed essentially with thin walls in comparison to profile piece 22.

- 20 Between collector 10 and first collector tube 12, overflow openings or overflow passages 28, 30 are provided. Overflow opening 28 or overflow passage 28 enables fluid or refrigerant to flow from collector 10 into first collector tube 12, and overflow opening or

overflow passage 30 enables fluid or refrigerant to flow from first collector tube 12 into collector 10. Between these overflow openings 28, 30, a sealing lip or a suitable separating means is provided that prevents fluid or refrigerant from flowing directly from overflow opening 30 into overflow opening 28 inside collector 10. In addition, in 5 collector 10 a dryer is situated that has a dryer cartridge and a filter. The dryer part of this dryer, or the dryer cartridge, removes moisture or water from the fluid or refrigerant. It can for example be provided that for this purpose a granulate or powder or the like is provided. The filter removes particles that may be present in the fluid or refrigerant, which may have entered this fluid for example as a result of wear.

10 First tube 20 can for example be a welded tube.

First profile piece 22 is fitted onto first tube 20 and is soldered thereto.

First tube 20 is sealed at its second, or lower, end 24. Thus, a closure element 32 is provided. This closure element 32, in the construction according to Figure 1, is connected non-detachably and in tightly sealing fashion to first tube 20. For example, here a 15 soldered connection can be provided.

In the area of second end 26, or the upper end of collector 10, a ring holder 34 is provided. This ring holder surrounds collector 10, or first profile piece 20 thereof, at least partially; here it surrounds the entire circumference. As is shown in Figure 2, this ring holder has a bending that small extends at the end surface of the profile piece. This ring 20 holder has in addition a prolongation that engages in the upper end or upper area of first collector tube 12. In this area, the prolongation of the ring holder can simultaneously form a cover for closing this first collector tube 12. It can also surround the collector tube from the outside. In addition, it can be inserted into the end-side opening of the collector tube in force-fit fashion. Preferably, the ring holder receives both first collector tube 12 25 and also collector 10, or first profile piece 22, in clamping fashion. By means of such a

ring holder, first collector tube 12 can be held on collector 10 or on first profile piece 22, or the positioning of collector 10 relative to first collector tube 12 takes place via this ring holder, at least in the upper area. In a soldering process in the soldering oven, ring holder 34 can then be soldered to first collector tube 12 and to collector 10 or first profile 22.

5 This can for example be such that first collector tube 12 is sealed at its upper end.

Before the filling in the collector oven, soldering points or adhesion points can also be provided for pre-fixing.

Figure 2 shows an upper section from the construction according to Figure 1 in an enlarged view, in which collector 10, or first tube 20, and first profile piece 22, as well as 10 ring holder 34, are partially sectioned, and the arrangement is tilted slightly forward in comparison to the construction according to Figure 1.

In Figure 2, the detachable closure 36 can be seen by means of which second end 26, or upper end 26, of the collector can be sealed. This closure element 36 is here fashioned as a stopper. Closure 36 has on its outer surface two circumferential grooves at a distance 15 from one another in the longitudinal direction, in which sealing devices, constructed as O-rings 38, are situated. On its inner surface, profile piece 22 has a sealing surface 40 for the O-rings of stopper 36.

In addition, in the inner surface of first profile piece 22 a circumferential groove 42 is provided that can receive a securing ring.

20 For the closing, stopper or closure 36 is placed into the first profile piece far enough that a securing ring that is situated in groove 24 or subsequent thereto holds the stopper or closure 36 in a closing position. This securing ring can be removed for example by means of a suitable tool in order to release the closure and to enable the dryer to be removed.

The closure can be prevented from falling into collector 10 by suitable means, stops, or the like.

For this purpose, for example spacer elements or stops or energy storage devices, such as springs or the like, can be provided.

- 5 Preferably, the dryer, which can be fashioned in particular as a dryer cartridge, is held detachably in a particular position.

For this purpose, for example an energy storage device or elastic holding elements or the like can be provided.

Exemplary realizations of such holding are disclosed in applicant's DE 103 06 192 A1,
10 and are incorporated by reference into the subject matter of the present disclosure as preferred constructions.

There, dryers are also disclosed that are constructed as dryer/filter cartridges. With respect to the construction of those dryers or dryer elements or filter elements or dryer/filter cartridges, which can be present as well in a preferred construction of the
15 present invention, reference is made to DE 103 06 192, which in this regard is incorporated by reference into the subject matter of the present disclosure.

First profile piece 22 has on its inner surface a circumferential beveling that enables for example a damage-free introduction of the O-rings. Correspondingly, this beveling is situated above the sealing surface of first profile piece 22.

20 As is shown in Figure 2, the wall thickness of the first profile piece is greater than the wall thickness of first tube 10. There, this is such that inwardly the first profile piece terminates essentially flush with tube 20 radially in the contact area between this first

profile piece 22 and tube 20, and outwardly a prolongation 44, conformed to the outer surface, is provided radially that overlaps or sheaths tube 20.

Here, tube 20 is supported axially on first profile piece 22, first profile piece 22 being fitted onto first tube 20.

5 Figure 3 shows an exemplary lower segment of the construction according to Figure 1 in an enlarged, partially cutaway representation.

In the cutaway representation, the dryer, or dryer cartridge, or dryer/filter cartridge can be partially seen, which can for example be constructed as described in applicant's DE 103 06 197. In particular, the dryer cartridge or dryer/filter cartridge can also form a unit with 10 a filter. A filter can however also be provided separately from a filter cartridge. The dryer cartridge and filter are also referred to as the dryer.

In Figure 3, overflow opening or overflow passage 28 is exposed. There it can be seen that stamped-out parts 60, 62 are provided in order to form an overflow opening of an overflow passage 28 in collector 10 or on first tube 20 on the one hand, and on first 15 collector tube 12 on the other hand, each protruding outwardly, and here inserted slightly into one another; however, this can also be realized differently. In the area of these overflow openings, this also holds for overflow opening 30, the first collector tube 12 and the and the collector 10 or first tube 20 on the one hand are soldered to one another in a leak proof manner.

20 Dryer/filter cartridge or dryer cartridge 64 of dryer 66 is held in a detachable snap seating 68 in collector 10, so that it is fixed in the longitudinal direction of the collector, but can also be detached in order to be exchanged. At least one of disk-shaped elements 69, 69a can be a sealing lip. Sealing lips 69, 69a can in particular be such that they prevent a direct flow of fluid or refrigerant from overflow opening or overflow passage 30 to

overflow opening or overflow passage 28, so that the fluid or refrigerant has to flow through the dryer.

In addition, in Figure 3 it is shown that a slot is provided between collector 10 and first collector tube 12, by which these are essentially situated spaced apart from one another.

- 5 Figure 4 shows a partial sectional view of the construction according to Figure 2.

As can be seen there, the beveling 44 of profile piece 22 is situated in the direction of upper, or first, end 24 of collector 10, from the point of view of the positions at which O-rings 38 are situated. In Figure 4, groove 42 can also be seen clearly, situated on the inner surface of first profile piece 22 and having a securing ring for holding closure 36.

- 10 In addition, in Figure 4 it can also clearly be seen that in the area of contact between first closing piece 22 and first tube 20 these parts terminate essentially flush on their inner surface, prolongation 46 of first profile piece 22 continuing in overlapping fashion on the outer surface of first tube 20. In addition, in Figure 4 securing ring 72, placed in groove 42, can be seen.

- 15 Figure 5 is an exemplary alternative construction of the collector 10 and the first collector tube 12 respectively, showing their respective lower end areas or the areas facing the first ends. This construction can in particular also be part of a heat exchanger. For example, the construction according to Figure 5 can, alternatively situated in the construction according to Figure 1, be in the lower area of the heat exchanger. In the upper area, 20 collector 10 according to Figure 5 can for example be constructed in the manner described in relation to Figures 2 and 4. In collector 10 according to Figure 5, for example a dryer/filter cartridge or dryer cartridge 64 of dryer 66 can for example also be situated in the manner that was described on the basis of Figure 3.

In the construction according to Figure 5, collector 10 differs in the end area facing first end 24 in particular in that first tube 20 does not extend up to end 24. According to Figure 5, a second profile piece or second extruded profile 80 is situated on the lower, or first, collector end. This second extruded profile 80 is connected to first tube 20 at the 5 side facing away from the first profile piece. In the construction according to Figure 5, a first profile piece is likewise provided as an example, which can in particular be as described above, which however is not shown in Figure 5. The wall thickness of second extruded profile 80 is greater than the wall thickness of first tube 20. The extruded profile 80 can be in particular such as the correspondingly shaped extruded profile, that is 10 described in the lower area of the collector in relation to the lower part of the collector in Figure 2 of the applicant's EP 131 07 48 A2, so that reference is made to this description and it is incorporated into the subject matter of the present disclosure. The same holds correspondingly for the lower area of the first collector tube, which is likewise shown in a corresponding manner in Figure 2 of EP 131 07 48, so that reference is made to the 15 statements made there concerning the construction of the first collector tube in the lower area, and these statements are incorporated into the subject matter of the present disclosure.

In particular, it is provided that second profile piece 80 has a greater wall thickness than does first tube 20 of collector 10. In the construction according to Figure 5, it is in 20 particular provided that the second profile piece on the side facing first collector tube 12 has through-bores 82, 84 into which rim holes 86 or 88 of the first collector tube or of cover 90 of the first collector tube are inserted in the assembled state. In addition, second profile piece 80 has an area 92 of its outer surface whose shape is conformed to an outer surface area 94 of first collector tube 12 or of cover 90, and, in the assembled state, 25 contacts this outer surface area or is conformed thereto. As can be seen in Figure 5, this outer surface area 92 of second profile piece 18 has a curved construction.

Figure 6 shows a construction, alternative to the construction according to Figures 2 and 4, of the upper end area, or of the end area of collector 10 situated in the area of second end 26, in a schematic, partially cutaway view. The construction according to Figure 6 can in particular be combined with a construction according to Figure 1 and/or according to Figure 3 and/or according to Figure 5. In the following, the differences in the construction according to Figure 6 from those according to Figures 2 and 4 are described; with respect to additional preferred constructive features, reference is also made to the description relating to Figures 2 and 4.

The construction according to Figure 6 differs from the construction according to Figures 10 2 or 4 essentially in that the sealing surface 40 for the two O-rings 38 is formed not by a segment of the inner surface of first profile piece 22, but rather by an inner surface segment of first tube 20. It is advantageous if this inner surface segment, or the inner diameter, of first tube 20 has a narrow or very narrow tolerance.

In the construction according to Figure 6, profile piece 22 is fashioned correspondingly 15 smaller, or shorter, containing only groove 42 for receiving securing ring 72. The profile piece is connected to first tube 20, for example in the manner described on the basis of the previous Figures.

Figure 7 is an exemplary construction of collector 10 in the lower area, which for example can be provided alternatively to the construction of collector 10 in the lower area 20 that was described on the basis of Figure 3, and can then be correspondingly combined with other constructions explained as examples on the basis of the Figures. In the construction according to Figure 7, a first profile piece 22 is also provided (not shown) in the upper, or second, end area of the collector, as is a detachable closure 36.

In the following, in particular the differences from the construction of collector 22 in the 25 lower area according to Figure 3 are described.

In the end area facing away from upper, or second, end 24, collector 10 has, in the construction according to Figure 7, a second profile piece 80a that is for example extruded. In addition, in the construction according to Figure 7 the collector is also sealed at its first, lower end by a (second) detachable closure 100. This (second)
5 detachable closure 100 can for example be constructed in the manner of closure 36, which detachably closes collector 10 at the upper, or first, end 24. In Figure 7, this closure 100 is constructed as a stopper that is essentially identical to stopper 36 that was described on the basis of Figures 2 and 4. Second profile piece 80a can also be constructed in the manner of the first profile piece that was described on the basis of
10 Figures 2 and 4. The second profile piece can for example be an extruded part.

In particular, in a corresponding manner, in particular two axially spaced circumferential grooves can be provided in stopper or closure 100, each bearing a sealing O-ring 38a that lies in tightly sealing fashion on an inner surface segment of second profile piece 80a or of first tube 20. The second profile piece can in particular have a circumferential groove
15 that bears a detachable securing ring that can hold closure 100. In particular, the connection between second profile piece 80a and the adjacent end of tube 20, including the corresponding shaping in the area of connection, can be as was described in relation to the connection between the other end of tube 20 and the detachable closure provided at the upper end.

20 The present invention makes it possible to remove or exchange the dryer upwardly, or through an upper opening of the collector. As is shown in particular by preferred constructions, the present invention provides a basis for saving costs by omitting a long extruded profile, in particular in constructions in which the dryer can be removed or exchanged upwardly or through an opening, or exchange opening, situated in the area of
25 the second opening. A construction according to the present invention, or a development thereof, can also be such as to save weight. A construction according to the present

invention can advantageously be used in motor vehicles in which it is advantageous or necessary to provide a detachable closure at the top of the collector in order to enable an advantageous, for example easier, exchange of the dryer, or even to make such an exchange possible. In addition, the present invention provides a basis for realizing, in a
5 simple manner, a thermal separation between the first collector tube and the collector.